

REMARKS

Claims 1-9, 12 and 13 are pending in this application. Claims 1-3 have been amended. No new matter has been added.

Claim Rejections under 35 U.S.C. §§ 102 and 103

The following rejections have been made in the Office Action:

Claims 1 and 12 are rejected under 35 U.S.C. §102(b) as being anticipated by JP 11-096608 to Nakajima (U.S. Patent No. 6,317,280 is equivalent).

Claims 3, 4 and 13 are rejected under 35 U.S.C. §102(b) as being anticipated by either the acknowledged prior art or the Nakajima et al. or Fuji et al. references.

Claim 2 is rejected under 35 U.S.C. §103(a) as being unpatentable over either the acknowledged prior art of figures 1-4 or the above noted JP system (JP 11-096608) further considered with Fuji et al. or alternatively the Nakajima/prior art system further reconsidered with Fuji et al. and Kojima et al.

Claim 5 is rejected under 35 U.S.C. §103(a) as being unpatentable over the art as applied to claim 3, and further in view of Belser et al. ('100)

Claim 6 is rejected under 35 U.S.C. §103(a) as being unpatentable over the art as applied to claims 3 and 2 respectively, and further in view of Novotny et al., U.S. Patent No. 6,603,713.

Claim 7 is rejected under 35 U.S.C. §103(a) as being

unpatentable over the art as applied to claim 3, and further in view of JP 05-298737.

Claims 8 and 9 are rejected under 35 U.S.C. §103(a) as being unpatentable over the art as applied to claim 2, and further in view of Yonezawa et al.

Applicants request reconsideration of the foregoing rejections in view of the foregoing amendments and for the following reasons.

The Background of the Invention section of the present application describes, as explained with reference to Figs. 1-3, a prior art magnetic flux detecting device 21 and recording magnetic field generating device 22 fixed onto the same head such that the relative direction between them is constant. As a result, as shown in FIG. 3, the difference in shape between the magnetic domain 31 recorded by the recording magnetic field generating device and the magnetic flux detecting device 32 is small at any track position. See page 3, lines 14-21 of the specification.

Applicants have further discussed that a known system executes recording by way of thermo-magnetic recording using an optical pulse magnetic field modulation method in which the approximately circular region of the optical pulse irradiation causes the recording magnetic domain to become approximately crescent in shape, as shown in Fig. 4. Therefore, when reproduction is executed with normal magnetic flux detecting means with sensitivity distribution being approximately linearly shaped, the recorded magnetic domain is different in shape from the magnetic flux detecting means. See, page 4, lines 14-17 and page 5, lines 9-19 of the specification. Further, with a minute light spot of an optical head as the heating means producing a heated area that is substantially circular, the greater the distance between the magnetic wall of the recorded magnetic domain and the tracking center of the heating means is, the

more of an inclination there will be of the magnetic wall, as shown in Fig. 4. This causes an alignment problem between the recorded magnetic domain and the magnetic flux detecting means. (Applicants note that Fig. 4 is not part of the prior art, but rather shows an illustration of the inventors' analysis of the problems that occur in the prior art, and therefore Fig. 4 is part of the invention.)

In one embodiment of the present invention, as shown in Fig. 6, the alignment problem is overcome by using an optical head having a movable part 62 that is driven linearly in the disk radius direction with a linear motor 63 so that accordingly the radiation position (dotted line) of the light spot moves linearly. Further, the magnetic flux detecting device 64 (the magneto-resistive element in the present embodiment) is mounted on the swing arm 65 and rotates on the fulcrum of the swing arm with the voice coil motor 66 so as to move along a circular arc (a dotted line). The swing arm inclines by approximately 20° in the innermost circumference/the outermost circumference track due to the geometrical positional relationship between the recording medium and the swing arm. Accordingly, the longitudinal direction of the magnetic flux detecting device inclines by approximately 20° with respect to the disk traversing direction. Therefore, as shown in FIG. 6, the track position of the magnetic flux detecting device is placed inward for the inner circumference and is placed outward for the outer circumference of the recording medium so the magnetic flux detecting device and the magnetic wall direction become in accord with each other.

In the present invention, the recording is performed in a different manner from the way in which recording is performed in the references of record. The claims have been amended in order to clarify the recording by defining the forming of the magnetic wall of a magnetic domain to be along a curve of a thermal distribution of

the partially heated region of the recording medium. This aspect of the invention is not disclosed by the references relied upon in the rejection.

Specifically, independent claim 1 has been amended to set forth that the recording medium is partially heated to form a magnetic domain whose magnetic wall is a along a curve of the thermal distribution of the partially heated region in a magnetic recording layer of the recording medium, while applying a magnetic field to the vicinity of the partially heated region and the orientation of magnetic domain is aligned with respect to the longitudinal direction of the magnetic flux detecting means in accordance with the position of recording. In claims 2 and 3, the magnetic domain is claimed to be formed so that the magnetic domain wall is a along a curve of the thermal distribution of the region heated by the heating means. Further, in claim 2, the difference between a radial position of the heating means when heating partially the recording medium to form the magnetic domain and a radial position of the magnetic flux detecting means when detecting the magnetic flux generated by the magnetic domain is changed so that a magnetic wall orientation of the magnetic domain is formed along a longitudinal direction of the magnetic flux detecting means at each recording track to be scanned during recording/reproducing. In claim 3, the orientation of the thermal distribution generated by the partial heating for forming the magnetic domain is claimed to be rotated in accordance with a radial position of the heating means when heating partially the recording medium to form the magnetic domain. Support in the specification for the amended claims can be found at page 35, lines 11-17. Also, Figure 12 shows the recording magnetic domain 123, for example.

In Nakajima, the magnetic wall of the magnetic domain is formed in a track traveling direction (circumferential direction), which coincides with the shape of the recording magnetic head (magnetic distribution). The width of the recording

magnetic domain is decided in accordance with the heating area. However, in Nakajima, because the reproducing head is disposed in parallel with the recording magnetic head, the direction of the recording magnetic domain and the direction of the reproducing head coincide with each other as shown in Figure 7, for example. Thus, although Nakajima discloses thermal-assisted magnetic recording, the reference does not disclose or suggest forming a magnetic domain whose magnetic wall is along a curve of a thermal distribution of the partially heated region, as in the present invention. Further, according to claim 1, the orientation of the magnetic domain is aligned with respect to the longitudinal direction of the magnetic flux detecting means in accordance with the position of recording, which is not shown by Nakajima.

As amended, the claims are patentable over the Nakajima reference. Further, neither Fuji nor Kojima overcome the deficiencies in the Nakajima reference with respect to the invention as now claimed in claims 2 and 3. In Fuji, a heating optical element is disclosed that extends in the same direction as the track. In Kojima, a thermal-assist magnetic recording system is disclosed that includes an optical system capable of two-stage heating and a recording medium. The magnetic wall of the magnetic domain that is formed in Kojima is in the track traveling direction or circumferential direction and coincides with the shape of the recording magnetic head. See Figure 1 of Kojima.

The remainder of the art is applied to the dependent claims. Each of the dependent claims is patentable over the references of record at least for depending from a base claim asserted to be allowable for the foregoing reasons. Further, none of Belser, Novotny, Yonezawa or JP 05-298737 make up for the deficiencies in the Nakajima and Nakajima-Kojima or Nakajima-Fuji combination relied upon in the rejections of the independent claims. Therefore the rejections under 35 U.S.C. §§102

and 103 should be withdrawn.

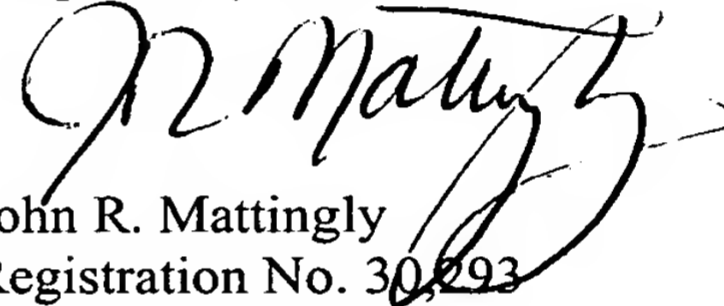
RCE

Applicants have filed a Request for Continued Examination (RCE) along with this Amendment After Final. Entry and examination of the foregoing amended and new claims is respectfully requested.

CONCLUSION

In view of the foregoing, Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,



John R. Mattingly
Registration No. 30,293
Attorney for Applicants

JRM/so
MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.
1800 Diagonal Rd., Suite 370
Alexandria, Virginia 22314
(703) 684-1120
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